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ABSTRACT

Unusual approaches to vocational training offered by the Business Data Processing Program at the Boulder Valley Re-2 Public Schools Area Vocational Technical Center are described, including the facility, equipment, individualized instructional media and materials, advisory committees, environment, curriculum, and placement for (1) the general program, (2) the computer operations career track, (3) business programming career track, (4) data entry career track, and (5) the formative accounting and mini-computer career tracks. The curriculum description outlines the various computer specialty areas in detail. (CHV)

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A UNIQUE BUSINESS DATA PROCESSING PROGRAM
by the

BUSINESS DATA PROCESSING

DEPARTMENT

BOULDER VALLEY Re-2

AREA VOCATIONAL TECHNICAL CENTER

6600 E. ARAPAHOE

BOULDER, COLORADO 80303

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BUSINESS DATA PROCESSING DEPARTMENT

Boulder Valley Re-2 Area Vocational Technical Center

A UNIQUE BUSINESS DATA PROCESSING PROGRAM

The Business Data Processing program at the Boulder Valley Re-2 Public Schools Area Vocational Technical Center offers a unique approach in vocational training. This program is the result of years of development through constant evaluation by both instructors and industry advisory committee members. What we offer here represents only the current program, for future changes are necessary to keep up with a constantly changing industry.

We would like to generally describe our uniqueness in the areas of 1) facility, 2) equipment, 3) individualized instructional media 4) advisory committees, 5) environment, and 6) curriculum.

What may be unique in our facility is that the instructional staff actually was allowed to work with an architect in the design of the present building. The modern building anticipates instructional requirements for the program. The four classrooms, which can be either separate or one large area, allow varied team teaching use of the area. The individualized study room is located close to the office area where students working on their own time can draw on the assistance of the staff -- who work many hours on their own time. This room is also the computer terminal room - with five terminals available for student use. The data entry room is designed for multiple use by all students and is located central to all areas of student activities. A separate Input/Output control room is set up to handle student work so that only authorized students are in the computer room. The large computer room itself is central to both student and school district program and computer usage.

The uniqueness of our program and equipment has been possible through the Boulder Valley School Board support of our many methods of computer usage. We have an IBM 370/145 that is configured in such a way as to make several different groups of people each think they have their own computer. IBM calls it Virtual Machine and in our program it allows unlimited and varied applications of the computer in vocational training. The equipment inventory includes hardware that is in current use by industry such as: two different kinds of disk units, (thirteen in all), three different tape units (five in all), two printers, in addition to the usual card reader/punch, consoles, CRT units, telecommunication control units, and the like which are only normally found in a multi-processing environment. And of course, we have the most up-to-date equipment in our data entry room, consisting of keypunch equipment (eight in all), three dual station keydisks (to meet new industry training requirements), plus typewriters, calculators, etc., to support the unique curriculum we offer.

The individualized instructional equipment we have allows us to meet many student needs through an 8 mm loop and video tape library. We have developed

an extensive collection of audio-visual media to allow students to move through the instructional material at as near their own pace as is possible. We do not feel an open entry-open exit program is practical due to the continual changes necessary to keep the curriculum up to date. Also, we have the capability to develop our own tailor-made instructional media in the Learning Resources Center located directly above our facility.

Although the make-up of our Advisory Committee program may not be unique, we take pride in having four separate advisory committees. We have established advisory committees -- one for each of the four Career Tracks. This allows closer communication with data entry supervisors, computer operations management, business programmer management and accounting management. We hope this kind of effort, to close the communication gap with industry, will result not only in a more up-to-date training program, but improved job placement of our students.

The total environment in which we operate our vocational training program may or may not be unique. Since the equipment used is far too expensive for only training, our operation is a much wider production shop. Such a program usually exists in close cooperation with a school district's accounting and business needs. The district Computer Services group not only supports our vocational training, but serves the District high schools in several innovative programs. A computer assisted instructional math program is an example. Of course, vocational students benefit directly from working with such a diversified computer production shop. This environment also allows the instructional staff to keep up with the ever changing nature of our industry.

All of these things we have mentioned are merely support systems for the unique curriculum that we have developed. We currently offer four Career Tracks in both the day high school program and the evening Post Secondary offerings. We would like now to explain each of them.

SECTION I

The Introduction to Computer course is offered each semester to provide students interested in the Business Data Processing field an opportunity to move in one of four directions: 1) continue another semester in Computer Operations; 2) continue three more semesters in Business Programming; 3) continue one more semester in Accounting; 4) find that this field is not a direction they want to continue. Students are placed in this course through the counselor assigned to our program. Here again we find our school may be unique in that our vocational counselors are not expected to know all things about all programs. Rather they are specialists in their assigned department areas. Their support of our program goes far beyond student placement.

Generally, as we attempt to provide basic data processing concepts, we move the students in the Introduction course along a series of lectures, audio-visual materials, and projects. Most of the semester is spent on projects that allow the student to learn on an individual "hands on" level with the entire data processing staff "team teaching" as resource people. We spend very little time on general data processing concepts (like history) and the only thing we do with Unit Record is a project on the use of our IBM 129 Keypunch machines and the 083 Sorter. We also have a project on the use of the 3742 Data Entry stations. We spend many hours on actual "hands on" work with our computer I/O devices; specifically the card reader-punch, printer, magnetic tape and disk. Then we move on to the area of programming with a project that involves the use of Utility programs stored in the computer.

Most of the last nine weeks of the semester is then involved in learning the RPG II business language. We do get into several other related areas and end up the course with the students doing a short payroll project. This project allows a student to tie the RPG II language into a business application. We continually emphasize that the computer and the languages are nothing more than tools to accomplish business requirements.

SECTION II

COMPUTER OPERATIONS CAREER TRACK

The Computer Operations Career Track is open to seniors and post high students. At present, the Computer Operations Career Track consists of one semester of Introduction to Computers and one semester in Computer Operations. The students must have earned a "C" or better in the Introduction course to continue into Computer Operations. See Section I on the course content of the Introduction to Computers semester.

The course is unique in six aspects: 1) Equipment, 2) Environment, 3) Curriculum, 4) Individualized Instructional Material, 5) Advisory Committees, 6) Placement.

Equipment

Students are trained in the Introduction to Computers course (1st semester) on the IBM 083 sorter, IBM 129 card data recorder and the IBM 3742 dual data station.

In the Computer Operations semester, the students are trained on the IBM VM 370/145 computer system. Peripheral equipment used to make up the IBM 370/145 is the CDC 28211-21 printer, the IBM 1430 printer, the IBM 2540 card reader punch, the STC 3670 tape drive, the IBM 2319 and the CDC 3330 disk, the IBM 3215 and DELWRITER II consoles, along with the NCR cathode ray tube.

Environment

Students work in a production environment. After eight weeks of extensive operator training, a regular computer operations department is set up. This includes three main areas: the first being the input/output section, which handles all jobs to be scheduled on the system, prepares all run sheets, tapes, and working with a system flow-chart writes up JCL for input. This same person handles all complaints that the users (mostly other students) may have and must resolve the problems.

The second area of responsibility is a peripheral operator. This person physically places the input into the system and hands all output over to the I/O clerk. The peripheral operator's main responsibilities are the printers, tape drives, punch, reader and disk units.

The third area is the console operator. This individual's main duties are to keep the Vo-Tech system operating. Responding to all console messages under a DOS or OS environment, communicating with the peripheral operator as to what resources are needed for processing job streams and logging in all problems on a problem log. This person acts as the lead operator, responsible for everything on his or her shift.

Here at Vo-Tech, we are fortunate to have a good working relationship with Computer Services. Computer Services runs all of the school district's work and, under the Virtual Machine concept, has overall authority on the 370/145.

For one day a week, one operator from the Operations class works with the Computer Services operator in running the entire system. The value of this area is in working with live critical data and feeling the pressure of the everyday responsibilities of the computer operator.

Another work assignment area is working with the I/O clerk from Computer Services. The training here again is with live data, but also to see how this area ties everything together. In this area, you work not only with computer operators, but you must learn how to communicate with the users, programmers, keypunchers, and tape librarians. Also, as an incentive to the better students, five weeks before graduation, ten students are selected to work four hours a day at the National Center for Atmospheric Research, Alpine Designs and the National Bureau of Standards for-on-the-job training. The students actually run the entire system at these installations.

When not working at one of the previously mentioned areas, the trainees are learning to interpret reference manuals, using audio visual aids, or working on data processing projects.

Curriculum

The curriculum scope of Computer Operations goes beyond "just button pushing". With our own operations set up, we are able to give an excellent broad look of how a computer operation area really operates. The operator not only learns how to run the computer, but how and when data is assembled for input and where the output is distributed.

At the present time, the Disk Operating System is taught. This is the type of operating system that the student works on for five months. OS VS1 is covered in the course by changing a disk pack; it can be brought up on the system very easily under the Virtual Machine concept. This is done presently at night for Post Secondary students wanting OS VS1 operating instruction.

Learning to communicate is a very important area in data processing and especially for the computer operator. So, terminology is emphasized along with working with other individuals on the system who need to know the status of certain devices NOW.

We try to develop excellent work habits in the students. Attendance is emphasized by requireing the students to call in when ill. Percentage points are taken off their grade for absences and tardiness. More than nine absences is a loss of grade and the certificate for the Operations Career Track. The student is expected to be at Vo-Tech for three hours a day with a fifteen minute break.

The computer operation students are required to work different shifts every week. Since shift work is required by industry, this is excellent training to show the student what shift work is like. The shift work is done within the three hours that the student is in class. To allow enough hands-on-time, the student teacher ratio is 12 to 1.

Additional areas of importance taught are job interviews, resumes, applications and handling living expenses once taking a job. Preparing the students on correct procedures for interviews and applications, as well as handling living expenses are some of the most important parts taught to enable a successful career as a computer operator.

Working with system flowcharts, DOS and OS job control languages, DOS utilities, scheduling, tape libraries, run sheets, security controls, confidentiality and operator guide usage are important areas covered by the operations course, all in 540 hours. Working with projects in these areas are for "hands on" development.

A new area of job placement for an operator is the mini-computer market. So, in adjusting the curriculum, instructing the operator through an accounting cycle is now being taught to improve business application understanding. Because the operator has spent eight weeks writing RPG II programs in the introduction class, this along with the accounting allows for much broader job market qualification.

The unique thing about the curriculum is for the operator to understand every job in the Data Processing organization including management decisions. Also, in the understanding of business as a whole, to have a feel for how important the computer operator position is in the chain between the users and the computer.

Leadership is taught through youth groups (Future Business Leaders of America and Phi Beta Lambda) and on the system with the console operator being in charge of all decisions and problem handling.

Through 540 hours, a professional attitude is developed for the operator toward the Data Processing field as well as other employees.

Individualized Instructional Materials

At the present time the students have access to over $60,000 worth of audio visual aids used in the program. These aids are used in support of lectures for computer operations and to provide insights into new procedures such as OS VS1.

Also being purchased is an operator simulation package from IBM for more console experience under DOS and OS, which will be run on a timesharing system called MUSIC.

Advisory Committees

Advisory Committees are used as a tool in keeping the Operations course as up-to-date as possible. People on the committee are computer operations supervisors and managers who recommend changes and advice for keeping the program up-to-date. Committee members from companies such as IBM, NCAR, Department of Internal Revenue for the State of Colorado, NeoData, Colorado University, Rockwell, and Storage Technology, serve as guest speakers who give an important insight into the "real world of Data Processing". Not only does the Advisory Committee help our program, but their suggestions go to the state level, where in turn they are used as guides for other state supported Data Processing programs.

Placement

At the present time, approximately 100% of all graduation students are placed as operators (about 30 per year) at an average starting salary of $8400 per year. An average of six students a year continue on to college, nine students don't receive a certificate, while two move or change career plans. Placement is based on availability of the graduating student to work as a computer operator.

Summary

The Computer Operator is a trained specialist. The era of "just button pushing" is behind us. The competition for jobs is very high with more and more emphasis on education for all Data Processing personnel in their related field.

The problems many schools have (both private and public) in trying to train computer operators are:

1. Up-to-date equipment: Many schools still train on second generation computers or unit record equipment only.

2. "Hands-on" training: Many schools still have the student observe. The students must be allowed to make mistakes, that is the only way they'll learn.

3. Adequate instructors: Again, many schools have only one instructor to teach programming, operations and data entry. No single person can know everything in data processing. You need specialists in each. The field in all three areas changes too fast for one person to keep up.

The Computer Operator, throughout the history of computers, has been the least trained member of the Data Processing staff, yet handling the millions of dollars worth of equipment. The training that the students go through here at Vo-Tech prepares them with a professional outlook toward their job as well as Data Processing as a career.

SECTION III

BUSINESS PROGRAMMING CAREER TRACK

Structure:

The Business Programming Career Track is a four Semester program consisting of the one semester Introduction to Computers course and three semesters of ANSI COBOL programming and business applications instruction. The uniqueness of the program lies not in the content of the course but rather in the manner in which the subjects are integrated into a working data processing environment.

The philosophy from which the course structure evolved can be summed up in one key word - - relevance. The concept of relevancy must exist within the environment, curriculum, instruction, equipment, and attitude of everyone associated with our data processing program.

Environment:

The atmosphere of the classroom is patterned after the relationship of programmer-trainees working under the supervision of an administrative senior programmer or a programmer/analyst. We as instructors serve as resource personnel to the students.

Attendance is treated as it is in industry; students call when they are going to be absent or late. A student who has excessive absences will lose either credit for the class or the right to a vocational recommendation, or both.

Grades are determined by a work measurement standard based on the amount and complexity of the tasks correctly completed within a specified period of time. Students must learn to pace themselves to work under time and pressure constraints. Time can be critical to a production data processing shop. Under many conditions, work completed too far after a deadline can be as bad as not completing the task at all. The grading method conveys to the student the need to be self-motivated and self-starting.

Curriculum:

To emphasize the direction of this program, the curriculum has been designed with integrated sections of technical data processing and introduction and exposure to business disciplines. These subjects are introduced in a block environment which represents classes five days a week with a minimum of approximately three hours per class. In this comprehensive exposure the students are provided with business applications from their managerial implications down to the level of specific accounting practices and theory. The data processing tools they are exposed to include the disciplines of general analysis techniques, task and sub-task definition and a working knowledge of a programming language that reflects three full semesters of work.

Business Applications:

The accounting and business segment of the programming curriculum provides the students with the application for their technical skills. The accounting is not provided on the assumption the students will be entering the accounting field. Rather, it is provided to enable them as business programmers to communicate with and serve business users of data processing. The objectives of the accounting curriculum are: to develop the student's business vocabulary; to develop the student's understanding of uses of accounting information, to develop the student's understanding of uses of accounting information, to develop the student's understanding of automated business systems, and to develop the student's understanding of business organization.

The classroom emphasis is not primarily on doing manual accounting (although a certain amount of this is necessary) but rather on developing and using automated accounting systems. Students initially learn the basic elements required to develop a simple manual accounting system for a sole proprietorship. Once they have this basic foundation they expand the system for use by a corporation. To do this, they study the procedures and functions of accounting for such factors as receivables and payables, plant assets and inventories. They also expand further their knowledge of business organization and structure. They hopefully develop an appreciation of not only the internal influences which affect a company but also of the external influences prevalent in the free enterprise system. Throughout these phases of the curriculum, the students participate in classroom discussions and projects directed towards modifying manual accounting procedures for automated systems. As the business applications portion of the curriculum is developed further, students will have opportunities to work with on-line business simulations at all stages of their accounting studies.

The ultimate melding of the students business knowledge and technical skills occurs when they develop an automated business system. The students are provided with basic guidelines for their systems; from there they can expand and refine the systems as their individual skill levels allow.

One of the most frequent concerns expressed by industry representatives about data processing students is their lack of understanding of business. It is hoped that this curriculum eliminates the "tunnel vision" so often a problem of data processing personnel.

Programming:

The greatest emphasis within the programming area is on program design. Improved programming technologies like structured code have in some instances improved program quality. But, one can have just as bad a program with structured code as one without.

The real crux of quality programming lies not only in the micro level of language application, but, in the design of the program itself. Functional analysis using HIPO subsets are one of the tools we use for design and documentation. Composite design and structured design are used for task determination and coupling heirarchy.

For the expression of logic we have dropped flowcharting in favor of a non-symbolic technique. Logic is expressed through Pseudocode or " funny English " as referred to by Ed Yourdon. ANSI flowcharting is also taught in case students encounter it on the job.

Coding itself is structured, and structured walkthroughs have been implemented for both the design and code phases. This technique has been excellent for bringing code out as public rather than private. In the case of students, compiles and tests have been cut by at least 2/3 with the resultant programs oriented around ease of maintainence and modification.

The fact that the principles of programming are essentially similiar between all business languages has determined our philosophy that it is much better to concentrate the educational effort on program logic and structure emphasizing language. To date the most widespread business language appears to be ANSI COBOL. This language is used by the students over a period of one and a half years. They are also exposed to a very basic level of Assembler language for sub-routines, linkages and de-bugging.

As the programming students apply their knowledge of COBOL to business applications, live projects or with a team under our Computer Services department, they work with Job Control languages, Sorts and Utilities, and shop standards for code, flowcharting and documentation. Other areas covered in this program include a lengthy exposure to file organization and access methods with particular emphasis on ISAM files.

The emphasis at the beginning levels of this program are on the introduction and general usage of these subject areas. In the latter part of this career track the emphasis is shifted to the specific applications of those same topics. At the start of the course students may tend to code and think in terms of one program for a solution to an entire problem. In the end of the course their thinking is in terms of systems and tasks.

As a summary our program is trying to teach the tools of programming as they apply to an application; not, just trying to solve problems out of a programming language text. We are utilizing a team teaching effort between a Business Applications and Accounting specialist, and a Systems and Programming person. Together we feel that we can offer a viable form of programming education that will result in a resource of personnel for industry.

The Business Programming Track that has been outlined here can best be characterized as being a step towards an alternative and hopefully realistic form of education. Unlike many other fields, it has been marked by extremely rapid change; evidenced by its growth from its inception some 20 years ago. As the program responds to this industry that demands more sophistication and greater scope, we hope that the community-at-large will both benefit from and support us in meeting modern educational needs.

SECTION IV

DATA ENTRY CAREER TRACK

The Data Entry Career Track is a one semester course open to seniors and post high students. To enroll in the course, a student must have a minumum typing speed of 35 w.p.m. and an acceptable score on the Card Punch Operator Aptitude test.

The course is unique in four aspects: 1) equipment, 2)environment, 3) curriculum, 4) placement.

Equipment:

In the Data Entry Operations class, the students are trained on both card and non-card data entry devices. Technical training on the IBM 129 Card Data Recorder and the IBM 3742 Dual Data Station comprise the major emphasis in the semester.

The students are also trained on TI and NCR terminals, electronic printing calculators, and the IBM 083 Sorter.

Having received training on a variety of equipment, the student is better prepared for employment. The choice of equipment is compatible with local firms.

Environment:

Students work in a production environment. Orientation at the beginning of the semester establishes the world-of-work philosophy. Attendance is required and if a student must miss a day a phone call is necessary. Attendance is viewed and graded as attitude. The student is expected to be working the entire shift and a short break is scheduled in the middle of the class time. Abuse of class time can affect a student's grade and will surely jeopardize his/her chance at successful completion of the course. Fringe benefits are included in the program--two sick days and a personal day which will not affect their grade.

To further establish a production environment, each student assumes the duties of "supervisor" for a short period of time at least twice in the semester. As "supervisor" he/she is responsible for the flow of

work, assisting other students when possible, attendance records, reference materials, preparation of the data to be run on the system and handling shift schedules.

All jobs punched on cards are graded by the computer. Students become aware of where their work goes, what is done to prepare it for the computer, and the additional time caused by inaccurate data entry work.

The jobs students do are a combination of text problems, teacher made simulation problems and selected production jobs. Jobs which will benefit the students are accepted from F.B.L.A., Vo-Tech staff, and students in Business Programming and Introduction to Computers.

Deadlines are an integral part of the course. Most of the course work is individualized and a student may progress through the tasks at his/her own pace. The only requirement that must be met is the deadline. This requirement is enforced as industry expects deadlines to be met.

As in the business community, we maintain a 1-to-1 student/machine ratio.

Curriculum:

The Curriculum of Data Entry Operations goes considerably beyond machine manipulation skills.

Today's Data Entry operator needs to be prepared for employment in a field where there is a myriad of machines. While it is impossible to train on every piece of equipment on the market, it is possible to build flexibility into the operator.

The Data Entry Advisory Committee feels this is best accomplished by the training on different types of equipment.

Today's operator may be called upon to perform a variety of functions and should be familiar with the total data processing operation: equipment, work flow, other people's jobs and vocabulary. It is equally important to be familiar with terminals, calculators and general clerical functions. These areas are included in the curriculum.

Placement:

At the present time there are more job opportunities than qualified graduates.

All certified graduates who sought positions have been employed.

Summary:

Gone are the days of the "sweat shop." The role of the Data Entry operator is one of a trained professional. Expanded duties and additional responsibilities have become the norm in business. Opportunities for advancement still exist.

With equipment rapidly changing in Data Entry, the structure of this career track will undergo drastic changes in the next five years. Local businesses are growing away from large production environments and will call for a redefining of the Data Entry operator's role in the business world. Education will meet the challenge.

In conclusion, we feel the many unique aspects of our program not only allows us to offer a modern up-to-date vocational training program, but further allows the flexibility to continually change and expand the curriculum to meet the requirements of our industry. It might be of interest that our Business Data Processing Department is separate from our Vocational Business Education. Each department has grown and operates independently from the other. The world of tomorrow -- through the challenge of the computer -- is what we are training students for. We feel we are providing the kind of Vocational training programs that will get the job done.

And finally, the unique staff is:

Richard K. Olson
Department Chairman

Gail Overton
Data Entry Coordinator

Mary Polland
Accounting Coordinator

Sharon K. Ratzlaff
Business Applications Coordinator

Raymond W. Woodcock
Computer Operations Coordinator

Thomas T. Yanari
Business Programming Coordinator

12/77

ADDENDUM

Accounting Career Track

Since the Accounting Career TRack is only in its formative stages at this time, we are still in the process of developing a more up-to-date approach to this area of instruction. We have developed a survey to determine the local industry needs in terms of a computer oriented accounting program. We have had many requests over the past years to provide such a vocational program but have not had the time or staff to work on it. Many other approaches to the teaching of accounting in the high schools and adult programs have seemed to be adequate over the past years for most needs--and will probably continue to be so. Since we have such an extensive computer environment we felt it would be a good idea to see if our local industries would hire students who have Computer Input-Output experience with their accounting training. We hope the survey--along with an industry Task Force committee of about twenty-five accounting members--will provide us the parameters for another unique career track.

Mini-Computer Career Track

As the mini-computer market continues to expand within Business Data Processing, we are continually trying to determine and define the necessary parameters. We are well aware that our current career tracks are not adequately preparing students for this new and exciting area; even though we have placed many students in jobs working with mini-computers. We have found some areas of agreement between business users of mini-computers, but feel it will take a couple more years to settle down. RPGII seems to be the language most mini-computers business users are moving toward, but overall, the roll of the mini-computer technician in a business application is yet to be defined.

Business Data Processing Department
Boulder Valley Vocational Technical Center
6600 Arapahoe Road
Boulder, Colorado 80303

BUSINESS DATA PROCESSING CURRICULUM

-Career Tracks-

The Center offers one of the most up-to-date and thoroughly researched data processing curriculums and facilities in the Rocky Mountain Area. To meet the needs of industry and students there are three career tracks available: Business Programming, Computer Operations, and Data Entry Operations. Hands-on training on the latest data processing equipment ensures the student of excellent learning opportunities in each of the three areas.

In order to provide a proper foundation for the Computer Operations and Business Programming tracks, an introductory course is required. That prerequisite, Introduction to Computers-V6A, serves to relate computer programmer and operator activities to the student so that a wiser selection on career tracks can be made. This course also provides an excellent foundation for persons interested in other areas such as accounting, business management, science and mathematics.

ED 160914

10/77

COMPUTER PROGRAMMING

I. General Description

This two year program is open to 11th, 12th, and post high persons and offers 15 units of high school credit per semester.

V6A - Introduction to Computers (one semester)

V6C - Business Programming I (one semester)

V6D - Business Programming II (one semester)

V6E - Business Programming III (one semester)

Students desiring to become business programmers should enroll in Introduction to Computers (V6A) which builds a basic foundation in data processing by operating and studying computer systems, input and output devices and programming languages. This is followed by three semesters of in-depth training which allows students to develop their programming skills in COBOL (Common Business Oriented Language) and to become thoroughly acquainted with related accounting techniques and business applications

II. Course Outline (1080 hours)

A. Introduction to Computers (270 hours)

1. Introduction to data processing
2. Brief history of data processing
3. Unit record (punched card) concepts
4. Computer number systems
5. Input/output media and devices
6. Processing and storage devices
7. Introduction to computer languages and programming
8. Flowcharting and decision tables
9. RPG Computer language

10. IBM 370 computer concepts

11. Systems analysis and systems considerations

12. Business systems

13. Data Entry (floppy disk) concepts

B. Business Programming - Programming Curriculum

B.1. V6C = Approx. 90 days — 135 hours
Programming portion = 45 days — (day=2 hrs. 40 min.)

1. A. Programming Logic and flowcharting — 65 hours
   B. Hierarchy charts
   C. Pseudocode
   D. Top-down structure

2. ANS COBOL programming & debugging — 50 hours

   A. Structured Code
   B. Input/output operation
   C. Computational procedures
   D. Decisions, IF & Nested IF's
   E. Condition Names
   F. Headings
   G. Level breaking
   H. Performs
   I. Core dump interpretation
   J. Sequential file processing, Tape & Disk
   K. Linkage edit maps
   L. Table handling

3. Computer oriented topics — 15 hours

   A. Internal operation and storage of computers
   B. Operating systems
   C. System 360/370 structure
   D. Introduction to Assembler language

4. System support functions — 5 hours

   A. Job control basics
   B. Utilities basics

Systems design concepts are interspersed wherever appropriate

B.2. V6D = Approx. 90 days — 187.5 hours
Programming portion = 62.5 days — (days = 2 hr. 40 min.)

1. Systems design concepts — 37.5 hours

   A. Basic File Organization and Access Methods
   B. Systems or related tasks, multi-program systems interfacing

2. System support functions 30 (hrs.)

   A. Job Control for applications
   B. Utilities (cont.) basics

3. Applications support 45 (hrs)
   A. Assembler as a support language for sub-routines
4. Project

   A. Currently an Accounts Receivable project designed to show the inter-relationship of Master and Transaction files, as well as a billing and record purging process.

      1. Students review A/R systems & its account needs.
      2. Plan and flowchart 5 programs. The first two themselves and the remaining 3 with a new team for each of the last 3. Coding is done in ANS COBOL with mixed ALC and COBOL called sub-routines.

         a. Build Master file prog.
         b. Update Master file prog.
         c. Build and Update Transaction file prog.
         d. Monthly billing & history file update.
         e. A/R scheduled by age.

B.3. V6E = approx. 90 days 217.5 hours
Programming portion = 72.5 days (days = 2 hrs. 40 min.)

1. Systems Design Concepts (45hrs.)

   A. Advanced File Organization & Access Methods
   *B. Structured Design

2. ANS COBOL advanced concepts (67½)

   A. COBOL applications of ISAM & DA files.
   B. Advanced assembler sub-routines & program linkages.
   C. Binary table search & sorts.
   D. Library usage.

3. Production programming

   A. Coordination with Computer Services Analysts on team production work.
   B. FBLA_PBL projects.

Remainder of time is for interview preparation and applications.

Documentation is included throughout all 3 semesters.

Continue Accounts Receivable project.

C. Business Programming--Accounting Applications Curriculum

C.1. V6C--90 days: 45 days of accounting (135 hours)

I. Overview of American economic system (3 hours)

A. Types of economic systems.
B. Functions of an economic system.
C. Free enterprise economic system
D. Role of accounting in business and economy.
E. Relations of accounting and data processing.

II. Basic calculator operation (3 hours)

A. Touch keying
B. Basic arithmetic operations
C. Use of memory
D. Machine maintenance

III. Accounting principles and practices (30 hours)

A. Definition of accounting
B. Types of accounting
C. Uses of accounting information
D. Business entity concept
E. Basic accounting equation
F. Accounting statements
G. Deferrals and accruals

IV. The accounting cycle (30 hours)

A. Recording, classifying and summarizing
B. Types of record books
C. Interim statements and procedures
D. End of year statements and procedures
E. Audit trail
F. Automation concepts

V. Accounting for a merchandising enterprise (22 hours)

A. Sales and cash receipts
B. Purchases and cash payments
C. Subsidiary ledgers and control accounts

VI. Accounting application (22 hours)

A. Project which allows student to keep books for a sole proprietorship for one month. Project uses five journals, two subsidiary ledgers, and applies entire accounting cycle.

VII. Business systems (25 hours)

A. Accounting for receivables and payables
B. Accounting for merchandise inventory
C. Accounting for plant assets and intangible assets
D. Automation concepts

C.2. V6D--90 days: 27.5 days of accounting (82.5 hours)

I. Business systems (22.5 hours)

A. Accounting for payroll
B. Internal control
C. Automation concepts

II. Accounting for corporations (40 hours)

A. Organization and operation
B. Stockholders equity
C. Departmental and branch accounting

III. Accounting application (20 hours)

A. Automation of accounts receivable system

1. Review of concepts of accounting for receivables
2. Relating receivables project to accounting concepts

C.3. V6E--90 days: 17.5 days of accounting (52.5 hours)

I. Accounting application (30 hours)

A. Project which allows student to keep books for departmentalized corporation for one month. Project uses voucher system for internal control and applies entire accounting cycle.

B. Relating receivables project to corporate books.

II. Financial analysis (22.5)

A. Management reports and special analyses
B. Financial statement analysis

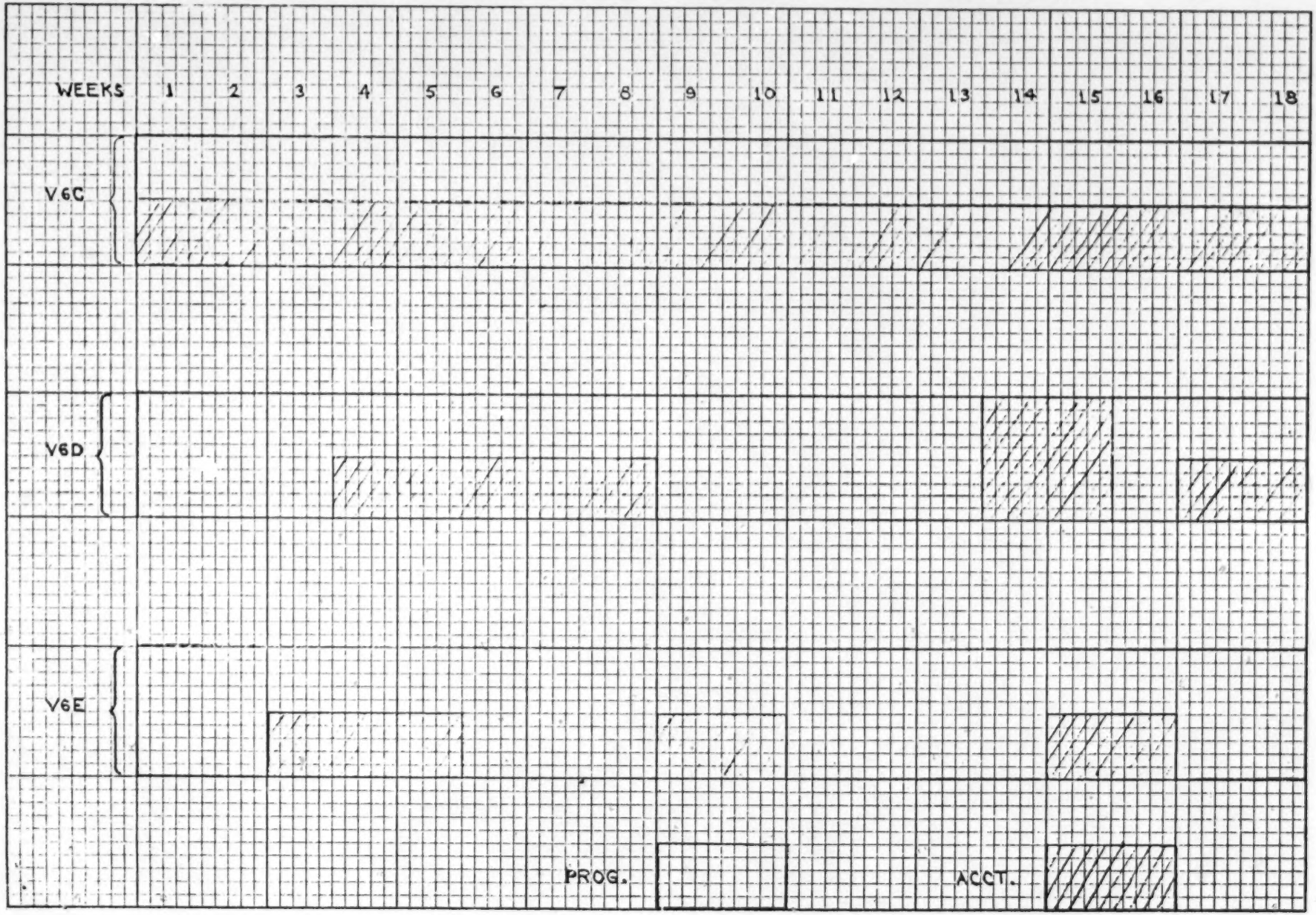
D. Youth Leadership Activities (5 hours)

1. Future Business Leaders of America

2. Phi Beta Lambda

KEUFFEL & ESSER CO.

E. DISTRIBUTION OF TIME ALLOCATED BY BUS. APPLICATIONS & PROGRAMMING



III. Program Objectives

* Upon successful completion of the business programmer track, a student will be able to:

A. Effectively work with IBM job control language, utility programs, and sort/merge routines.

B. Write COBOL programs: (1) in order to maintain existing software, (2) to create various file processing programs, (3) and to debug COBOL programs.

C. Write basic report program and generator (RPG) program.

D. Prepare a job stream for various business systems.

E. Automate payroll, accounts receivable or similar accounting systems.

F. Operate various data entry devices.

G. Create and maintain system and program documentation.

H. Communicate effectively with fellow workers.

I. Perform bookkeeping activities.

*Successful completion is defined as meeting at least an average (C) level of requirements including attendance, attitude and other job related activities.

IV. Resource Materials

A. Textbooks

Several textbooks are used during the three semesters

1. Accounting Principles, by Niwonger & Fess. South-Western Publishing Co. 1973

2. Introduction to the Computer - The Tool of Business, 2nd edition, by William M. Fuori. Prentice-Hall

3. Introduction to Computer Programming - ANSI COBOL by Gary B. Shelly and Thomas J. Cashman. Anaheim Publishing Co. 1974

4. Advanced ANSI COBOL by Gary B. Shelly and Thomas J. Cashman. Anaheim Publishing Co. 1974

5. OS Job Control Language by Gary B. Shelly and Thomas J. Cashman. Published by Anaheim Publishing Co. 1974

6. Computer Programming RPG II by Gary B. Shelly and Thomas J. Cashman. Published by Anaheim Publishing Co. 1976.

B. Supplemental Materials

The following supplemental materials are used:

1. IBM reference manuals

   a. COBOL Specifications
   b. COBOL Programmers Guide

2. Utility manuals

3. Automating general ledgers - Chicago Seminar

4. DOS Utilities Sort Merge/Multiprogramming by Shelly and Cashman. Published by Anaheim Publishing Co. 1973

5. DOS Job Control for COBOL Programmers by Shelly and Cashman. Published by Anaheim Publishing Co. 1973

6. Introduction to Flowcharting and Computer Programming Logic by Shelly and Cashman. Published by Anaheim Publishing Co. 1973

7. Periodicals

   a. "Computer Decision"
   b. "Computer World"
   c. "Business Week"
   d. "Info System"
   e. "Data Management"

C. Educational Media

The media materials used are the following:

1. Advanced Systems Incorporated

   a. "Introduction to 360/370" video courses
   b. "File Organization and Accessing Methods" video course

2. Accounting wall charts

3. IBM 16mm "A Much Better Way" on virtual storage

4. Filmstrips "On-the-Job Training" from Vo-Tech Media Center

5. CDC 8mm film loop complete library

D. Equipment Available for Training

1. IBM 370/145 computer system including:

   a. DOS (VM) operating system
   b. Seven Storage Tech tape drives
   c. Six 2314 and seven 3330 disk drives
   d. One IBM 1403 and one CDC 512 printer
   e. One card read/punch unit
   f. Three different types of consoles

2. IBM sorter (one)

3. Decollator and detacher

4. Keypunch machines (eight)

5. IBM 3742 Dual Data Entry (three)

6. Calculators (printing and programmable)

7. Memorex microfilm processor

V. Evaluation

Evaluation is based on programming abilities, projects completed, tests on theory, attendance, and job attitudes. A complete breakdown is provided to each student so that corrections can be made or upgrading can be accomplished.

VI. Prerequisites

Introduction to Computers (V6A) is a prerequisite. Then the student should proceed through the career track as follows:

Business Programming I	- V6C
Business Programming II	- V6D
Business Programming III	- V6E

VII. Requirements

The student must be at least a junior in high school when beginning the career track.

VIII. Jobs Available after Training

Students will be able to find jobs as programmer trainees, junior computer programmers, maintenance programmers, accounting clerks and general clerical personnel.

COMPUTER OPERATIONS

I. General Description

This one year program is open to first or second semester senior and post high students, and offers 15 units of high school credit per semester. See course schedule for times offered.

V6A-Introduction to Computers
(one semester)

V6B-Computer Operations
(one semester)

Students desiring to become computer operators must enroll in Introduction to Computers (V6A) to build a basic foundation in data processing by operating and studying computer systems, input and output devices, and programming languages. Completion of this introductory course is followed by a semester of Computer Operations in which students expand their knowledge by researching in depth specific characteristics of computers and operating systems. In addition to having "hands-on training" on up-to-date equipment, one also may work at on-the-job training stations. Introduction to Computers --the first semester of the program--may be entered in the first or second semester. There are no prerequisites for the course; however, typing and business courses provide a helpful background. When students finish this career track they should be able to go directly to work.

II. Course Outline (540 clock hours)

A. Introduction to Computers (270 hours)

1. Introduction to Computers
2. Brief history of data processing
3. Unit record (punched card) concepts
4. Computer numbers systems
5. Input/output media and devices
6. Processing and storage devices
7. Introduction to computer languages and programming
8. Flowcharting and decision tables

9. RPG II computer language

10. IBM 370 computer concepts

11. Systems analysis and systems considerations

12. Business systems

13. Data Entry (floppy disk) concepts

B. Computer Operations (240 hours)

1. The consoles and consoles' typewriter

2. Spooling and console spooling techniques

3. Scheduling and documentation

4. Operating in a batch environment

5. Job control languages (JCL) DOS and OS

6. Operating systems

a. IBM - operating systems

b. IBM - disk operating systems

c. IBM - virtual storage - multi-programming with a fixed number of tasks

7. Communications between console operator, peripheral operator, and input/output control section

C. Accounting

1. Accounting through the accounting cycle

D. Job interview, applications and resumes' (30 hours)

E. Living expenses after taking a job

F. Youth Leadership Activities

1. Future Business Leaders of America

2. PHI BETA LAMBA

G. On-the-job-training with School District Computer Services, National Center for Atmospheric Research, Bureau of Standards and Alpine Design.

III. Program Objectives * Upon successful completion of the career track, the student will be able to:

A. Operation of computer equipment and peripheral equipment

B. Use operating instructions to determine correct system setup by reading system flowcharts

C. Communicate effectively with the operating system through DOS and OS job control language

D. Operate console and prepare input/output units for operations

E. Review program operating instructions to understand operations and recognize potential operating problems for scheduling

F. Log run times, and tapes created

G. Identify the nature of malfunctions and log them

H. Checks and corrects malfunctions by referring to operating instructions

I. Write standard input/output utility programs including ditto

J. Prepare personal information and perform the job interview

K. Maintain an employable attitude toward the job, the employer, and fellow workers

L. Operate a disk operating system

M. Communicate effectively with fellow workers

N. Have light bookkeeping skills and business terminology

* Successful completion is defined as meeting at least an average (C) level of requirements, including attendance, attitude and other job related activities.

IV. Resource Materials

A. Textbooks

1. Introduction to Computer Operations, by Fuori, Darco, and Orilis. Published by McGraw-Hill, 1973

2. Introduction to the Computer, by William M. Fuori. Published by Prentice-Hall. 1977 2nd edition

3. OS Job Control Language, by Gary B. Shelly and Thomas J. Cashman. Published by Anaheim Publishing. 1975

4. Computer Programming RPG II by Gary B. Shelly and Thomas J. Cashman. Published by Anaheim Publishing. 1976

5. Accounting 10/12 - Second edition, by Freeman, Hanna & Kahn. Published by McGraw-Hill Publishing Co. 1973

6. DOS Utilities Sort/Merge Multiprogramming, by Shelly and Cashman. Published by Anaheim Publishing. 1973

B. Supplemental Materials

1. IBM Systems/370 Summary

2. IBM Systems/370 Principles of Operations

3. ASI reference manuals

4. IBM reference manuals on the IBM 360/370 System, DOS messages, and JCL

5. IBM Virtual Machine Operator's Guide

C. Educational Media

1. Video programs by Advanced Systems Incorporated on IBM 360/370 systems, disk operating systems, and Virtual machines.

2. 8mm CDC Modulearn system (extensive library)

D. Equipment available for training

1. IBM 370/145 computer system, including:

a. DOS (VM) operating system

b. OSVSI (VM) operating system

c. VM Spooling

d. Five Storage Tech tape drives

e. Six 2314 and seven 3330 disk drives

f. One IBM 1403 and one CDC 512 printer

g. One card read/punch unit

h. Three different types of consoles

2. IBM Sorter (083)

3. Decollator and detacher

4. Data Entry machines (IBM 129 and IBM 3742)

5. Calculators (printing and programmable)

V. Evaluation

Evaluation is based on test scores, ability to operate peripheral equipment, setup job control, operate the console, attendance and job attitudes.

VI. Prerequisites

Introduction to Computers (V6A) is a prerequisite to Computer Operations (V6B).

VII. Requirements

A student must be a senior and turn 18 within 4 months of graduation when completing this track so that employment can be obtained without conflicts. If a student desires this track as a second semester junior, at least one semester of Business Programming is recommended. The programming information is very valuable in order to better relate operations concepts (and some companies require it).

VIII. Jobs Available after Training

Students completing this track will find employment as junior Computer Operators, peripheral operators, input/output control clerks, tape librarians and mini-computer operators.

DATA ENTRY OPERATIONS

I. General Description:

This one semester program is open to grade 12 and post high school students and offers 15 units of high school credit per semester. Available 3rd session.

V6G-DATA ENTRY OPERATIONS

The students learn to operate IBM keypunch and verifier machines, key-to-diskette devices, other card handling devices, electronic printing calculators, TI and NCR terminals.

II. Course Outline (250 clock hours)

A. General Introduction to Data Processing (30 hours)

1. Types of data entry devices
2. Data processing equipment
   a. Computers
   b. Unit Record
   c. Peripheral
3. Data processing job market
4. Role of data entry operator
5. Vocabulary
6. Mini-project IBM 029 Card Punch

B. Technical training on IBM 129 Card Data Recorder and IBM 3742 Dual Data Station (160 Hours)

1. Parts of the machines
2. Medium of the machines
   a. Cards
   b. Floppy disk
3. Languages of the machines
   a. Hollerith
   b. EBCDIC
4. Functional keys
5. Control switches
6. Program control
7. Left zero, right adjust
8. Program levels
9. Data flow
   a. Buffered
   b. Non-buffered
10. Error correction
11. Card jams
12. Maintenance
13. Production projects on each machine

C. Sorter (6 hours)

D. Electronic printing calculators (20 Hours)

1. Basic Operations
2. Business Mathematics

E. Introduction to terminal entry (22 Hours)

F. Job Applications, Interview Techniques and Resume Preparation (12 Hours)

G. Youth Leadership Development

1. Future Business Leaders of America
2. Phi Beta Lambda

III. Program Objectives

Upon successful completion of this track a student will be able to:

A. Pass a 20 minute test consisting of alphabetic-numeric material with 8,000 correct keystrokes per hour.

B. Perform all keying and/or verifying operations (alphabetic, numeric, automatic skipping, automatic duplication, left zero and various program levels) under program control on the IBM 129 Card Data Recorder and the IBM 3742 Dual Data Station.

C. Perform signing on and off routines on NCR and TI terminals, interact using BASIC language.

D. Perform, by touch, the basic math functions (+, -, x, ÷) on electronic printing calculators.

E. Sort alphabetic and numeric data on the IBM 083 sorter.

F. Pass with 70% accuracy both a written and a practical exam over data processing terminology, equipment and procedures.

G. Fill out a job application and prepare a resume in a manner suitable to a prospective employer.

IV. Resource Materials

A. Supplemental Books

1. Easily Applied Principles of Keypunching by E. A. Payne and W. F. Payne. Published by Prentice-Hall. 1970

2. IBM reference manuals for 129 Card Data Recorder and 3742 Dual Data Station.

3. Key Punch Operations by William J. Claffey. Published by Dickenson Publishing Company., 1972.

4. Programming in BASIC by Tom Logsdon. Published by Anaheim Publishing. 1977.

B. Educational Media

1. EDLSpeed Reader
2. Sound on Slide-Verify unit 129 Card Data Recorder

C. Equipment Available for Training

1. IBM 129 Card Data Recorder (eight)
2. IBM 3742 Dual Data Station (three)
3. IBM 083 Sorter (one)
4. Electronic Printing Calculators
5. NCR 796-01 Terminal (two)
6. Texas Instrument Electronic Data Terminal (three)

V. Evaluation

Evaluation is based on practical application exams on all machines, daily production, ability on equipment, attendance and job attitudes.

VI. Prerequisites

A typing speed of 35 words per minute and a minimum score of 100 on the Card Punch Operators Aptitude Test are prerequisites. General clerical training or experience would be helpful.

VII. Jobs Available After Training

Students completing the program are placed as data entry operators. Some are able to combine their skills and incorporate sorting and clerical functions in their data entry position.

updated September 1977